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THE ENHANCED LINES OF SCANDIUM AS IONIZATION INDICATORS

Tests of the effect on the enhanced lines of scandium of mixtures in the electric furnace with substances having lower ionizing potentials were made in the same way as the experiments on the calcium, strontium, and barium spectra described in the *Astrophysical Journal,* June, 1922.

A fundamental feature of Saha's theory of the radiation of gases is the concept of an electron gas which at a given temperature and pressure has a definite concentration. The constituents of a mixed vapor will contribute to this electron gas in proportion to their ease of ionization. An element relatively difficult to ionize will then have its enhanced lines suppressed, since theory indicates that these are due to the ionized atom, and in such a mixture this element can emit only arc lines. Such a condition was found to hold in the spectra of calcium, strontium, and barium, whose enhanced lines can be obtained in the furnace, but when mixed with vapors of potassium and caesium, having lower ionizing potentials, the enhanced lines fade out, as the potassium or caesium contributes the greater part of the ionized atoms possible under the given conditions. The same phenomenon has since been observed in the case of scandium, the lines of which in the solar spectrum are almost entirely of the enhanced type. As the series relations in the scandium spectrum are not known, this observation furnishes the first proof that its enhanced lines are due to the ionized atom. The ionizing potential of scandium is also not known, but experiments with the furnace showed its enhanced lines to be affected in different degrees by potassium and barium, whose ionizing potentials are 4.3 and 5.1 volts, respectively, and unaffected by calcium, which requires 6.1 volts. This indicates that the ionizing potential of scandium is close to that of calcium. The method can be used in the study of other elements whose enhanced lines are within the range of furnace temperatures, and affords a means of picking out lines due to the ionized atom which is in some respects more definite than the usual method of comparing arc and spark spectra.

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